

REMARKS

In the Office Action, the Examiner rejected claims 1-7. Claim 1 has been amended by the present Response, while claim 3 has been canceled. The Examiner objected to a typographic error in claim 4, which has also been amended by the present Response to correct the error. The Examiner also objected to the title and abstract of the specification. Though Applicants do not necessarily agree with the Examiner's objection, the title and abstract of the present application have been amended in the interest of efficient prosecution. Upon entry of the amendments, claims 1, 2, and 4-7 will remain pending in the present patent application. Applicants respectfully assert that the claims, as presently presented, are patentable and are in condition for allowance. Consequently, Applicants respectfully request reconsideration and allowance of the pending claims.

Claim Rejections Under 35 U.S.C. § 102

In the Office Action, the Examiner rejected claims 1, 2, 4, and 7 under 35 U.S.C. § 102(b) as being anticipated by Howorth (G.B. Patent No. 2,214,382 A). Specifically, with respect to independent claim 1, the Examiner stated:

For Claim 1, Howorth discloses, as shown in figure 2 and as stated on pages 2 (lines 21-33), 3 (lines 1-13), 10 (lines 23-25), 11 (lines 1-8), and in the abstract, a camera (see figure 2) comprising a charge-coupled device (CCD), the CCD (26) having an anti-stokes phosphor (29) bound to the light receiving surface thereof (the phosphor 29 is coupled to the light receiving surface of the CCD 26 by means of fiber optics 25); and a housing surrounding the CCD (26) and defining an aperture through which, in use, light can pass and be received by the phosphor (29; a housing is inherent or else the camera would be rendered ineffective for picture taking).

The phosphor is anti-stokes because the phosphor is sensitive to infrared radiation and emits visible radiation. Infrared radiation comprises wavelengths ranging from 1 micron to 750 nanometers and visible radiation comprises wavelengths ranging from 750 nanometers to 400 nanometers. The radiation energy is directly proportional to the radiation frequency. Since, the radiation frequency is inversely proportional to the radiation wavelength, longer wavelengths have less energy and shorter wavelengths have more energy. The phosphor (29) absorbs infrared radiation, which has longer wavelengths and less energy, and emits visible radiation, which has shorter wavelengths and more energy.

Paper 5, pages 3-4.

Applicants respectfully traverse this rejection. A *prima facie* case of anticipation under 35 U.S.C. § 102 requires a showing that each limitation of a claim is found in a single reference, practice or device. *In re Donohue*, 226 U.S.P.Q. 619, 621 (Fed. Cir. 1985). For a prior art reference to anticipate under Section 102, every element of the claimed invention must be identically shown in a single reference. *In re Bond*, 910 F.2d 831, 15 U.S.P.Q.2d 1566 (Fed. Cir. 1990). Therefore, if the claims recite even one feature not found in the cited reference, the reference cannot be said to anticipate the claimed subject matter.

Claim 1 of the present application recites a camera comprising “a charge-coupled device (CCD) ... having an anti-stokes phosphor bound to the light receiving surface” of the CCD. Further, independent claim 1 has been amended to also recite a phosphor that “emits in the range of 950nm to 1075nm.” The Howorth reference fails to teach, and in fact teaches away from, such subject matter. Therefore, as discussed below, Applicants respectfully submit that the subject matter of independent claim 1, as well as claims 2 and 4-7 depending therefrom, is patentable

over the Howorth reference cited by the Examiner. Accordingly, Applicants request withdrawal of the Examiner's rejection and allowance of these claims.

The Howorth reference discloses image detector systems sensitive to IR radiation. Page 1, lines 2-5. More particularly, the disclosed image detector systems employ IR scintillators with less expensive photodetectors, resulting in "cheap, high resolution detector arrays" responsive to IR radiation. Page 2, lines 21-32. In the particular embodiment cited by the Examiner, IR radiation is focused by an image-forming lens (21) onto "an IR scintillator (29) comprising a scintillator layer (23) on a suitable substrate (22)." Page 10, line 23 – page 11, line 2. The scintillator layer (23) is bound to *a fiber optic image size corrector (25)* via optical cement (24). Page 11, lines 3-6. In turn, the fiber optic image size corrector (25) "provides *optical coupling* to a silicon charge coupled device (CCD: 26)" [italics added]. *Id.*

The Examiner cites one passage of the Howorth reference (page 10, line 23 – page 11, line 8) as indicative of a CCD having a "phosphor bound to the light receiving surface thereof" as recited in claim 1. However, the passage cited by the Examiner fails to show this subject matter. In accordance with Applicants' characterization of the reference above, the cited passage of the reference does disclose a scintillator layer (29). However, this scintillator layer (29) is not bound to a light receiving surface of the CCD (26). Instead, as discussed in the passage and illustrated in Figure 2, one side of the scintillator layer (29) is bound to a substrate (22), while the other side is bound to a fiber optic image size corrector (25). In this case, it is the distal ends of the fiber optic cables of the fiber optic image size corrector (25) that are bound to the CCD (26), not the scintillator (29) as incorrectly suggested by the Examiner. While the fiber optic cables of the

fiber optic image size corrector (25) may provide optical coupling of the scintillator layer (29) and the CCD (26), the reference clearly does not disclose a CCD having a “phosphor *bound* to the light receiving surface thereof” as recited by the present claim. Further, the Examiner’s interpretation is inconsistent with the cited reference, which states that forming the scintillator layer directly onto the photodetector is undesirable while teaching, instead, the bonding of the scintillator layer on a substrate to improve efficiency of the scintillator layer. *See, e.g.*, page 5, lines 9-14.

As mentioned above, independent claim 1, as presently amended, also recites a phosphor that “emits in the range of 950nm to 1075nm.” This subject matter was present in claim 3 of the original application and was rejected by the Examiner under 35 U.S.C. § 103(a). In the rejection, the Examiner conceded that this subject matter was not present in the Howorth reference. *See* paper 5, page 5. Applicants vigorously disagree with the Examiner’s contentions with respect to this subject matter, as discussed further below with respect to the obviousness rejections. Suffice it to say that the inclusion of this subject matter, which is not shown in the Howorth reference, necessitates withdrawal of the Examiner’s § 102 rejection of claims 1, 2, 4, and 7.

In view of the remarks set forth above, Applicants respectfully submit that the subject matter of independent claim 1, as well as claims 2, 4, and 7 depending therefrom, is not anticipated by the Howorth reference. Further, none of the other references cited by the Examiner obviate the deficiencies of the Howorth reference. Accordingly, Applicants respectfully request withdrawal of the Examiner’s rejections and allowance of claims 1, 2, and 4-7.

Claim Rejections Under 35 U.S.C. § 103

In the Office Action, the Examiner rejected claim 3 under 35 U.S.C. § 103(a) as being unpatentable over Howorth in view of Valdna et al. (U.S. Patent No. 6,254,806). The Examiner similarly rejected claims 5 and 6 of the present application under 35 U.S.C. § 103(a) as being unpatentable over Howorth in view of Ohwaki et al. (U.S. Patent No. 5,541,012). As discussed below, Applicants respectfully traverse the rejections.

As noted above, claim 3 has been canceled by the present Response. However, Applicants believe the Examiner's rejection remains pertinent as the subject matter of this claim has been incorporated into independent claim 1. Though Applicants believe the currently pending claims are allowable for reasons set forth above with respect to the § 102 rejection, the claims are also patentable on the basis of this newly incorporated subject matter of claim 1. With respect to the subject matter of former claim 3, now present in claim 1, the Examiner stated:

As for claim 3, Howorth discloses, that the phosphor (29) emits in the visible light range comprising wavelengths 750 nanometers to 400 nanometers. However, Howorth does not disclose wherein the phosphor (29) emits in the near infrared range comprising wavelengths ranging from 1100 nanometers to 800 nanometers and accordingly does not discloses emitting in the range of 950 nanometers to 1075 nanometers.

On the other hand, Valdna et al. also disclose a phosphor. More specifically, Valdna et al. disclose, as stated in columns 1 (lines 15-50) and 3 (lines 63-66), an improved phosphor having a peak emission in the red or near-infrared wavelength range. The near-infrared wavelength range comprises wavelengths ranging from 800 nanometers to 1100 nanometers, which includes the wavelength range 950 to 1075 nanometers. As stated in column 1 (lines 15-32), at the time the invention was made, one with ordinary skill in the art would have been motivated to include a phosphor having a peak emission including wavelengths ranging from 950 nanometers to 1075 nanometers, as taught by Valdna et

al. in the camera with phosphor, disclosed by Howorth, as a means for enabling the phosphor output to match the maximum quantum efficiency of the CCD while maintaining a low afterglow so as to achieve a high dynamic range and minimize ghost images and streaking. Therefore, at the time the invention was made, it would have been obvious to one with ordinary skill in the art to include a phosphor having a peak emission including wavelengths ranging from 950 nanometers to 1075 nanometers, as taught by Valdna et al. in the camera with phosphor, disclosed by Howorth.

Paper 5, pages 5-6.

Applicants traverse this rejection. The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (PTO Bd. App. 1979). Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention absent some teaching or suggestion supporting the combination. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d. 1430 (Fed. Cir. 1990). Accordingly, to establish a *prima facie* case, the Examiner must not only show that the combination includes *all* of the claimed elements, but also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972 (B.P.A.I. 1985). The Examiner must provide objective evidence, rather than subjective belief and unknown authority, of the requisite motivation or suggestion to combine or modify the cited references. *In re Lee*, 61 U.S.P.Q.2d. 1430 (Fed. Cir. 2002).

The Valdna et al. reference discloses prior art phosphors, based on $ZnSe_{1-x}Te_x$ and $ZnSe_{1-x}Te_x:Cu:Cl$, sensitive to x-ray radiation. Col. 1, lines 32-36. These phosphors “show high luminescence with a peak emission near 650-700nm … and have an energy efficiency of about 20%.” *Id.* The reference is particularly directed toward producing an improved phosphor material *similar to these prior art phosphors*. Col. 1, lines 32-50; col. 2, lines 63-66. Of particular concern to Valdna et al. was the non-linear output of these prior art phosphors and an undesirable afterglow present after exposure to *x-rays*. *See* col. 1, lines 41-49.

Conversely, claim 1, as presently amended, recites an “anti-stokes phosphor” that “emits in the range of 950nm to 1075nm.” As discussed previously, the Examiner has admitted that this subject matter is not present in the Howorth reference. Contrary to the Examiner’s assertion, the Valdna et al. reference fails to cure this defect. The phosphors of the Valdna et al. reference are configured to receive high energy x-rays (with wavelengths of 10nm or less) and emit lower energy photons in a portion of the visible spectrum (650nm - 700nm). Because the quantum energy of the electromagnetic radiation emitted by the phosphors are less than that absorbed by the phosphors, the phosphors of the Valdna et al. reference clearly follow Stokes Law and cannot be rationally described as “anti-stokes phosphors” as recited by the present claim. Further, the phosphors taught by Valdna et al. emit electromagnetic radiation with wavelengths within the range of 650nm to 700nm, which is well within the visible light range of the electromagnetic spectrum. *See* col. 1, lines 32-36. Consequently, the phosphors do not emit in any of the near infrared portion of the spectrum, let alone the more specific range of 950nm to 1075nm recited in the instant claim. The Examiner, therefore, has failed to show each and every element recited by independent claim 1.

Even assuming, for the sake of argument, that the Examiner were able to find *all* of the limitations of claim 1 within these two references, including an anti-stokes phosphor bound to a CCD, the proposed combination of the Howorth and Valdna et al. references is improper. A *prima facie* case of obviousness may be rebutted by showing that the art, in any material respect, teaches away from the claimed invention. *In re Geisler*, 116 F.3d 1465, 1471, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997). In fact, teaching away from the art is a *per se* demonstration of lack of *prima facie* obviousness. *In re Dow Chemical Co.*, 837 F.2d 469, 5 U.S.P.Q.2d 1529 (Fed. Cir. 1988). Accordingly, it is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 U.S.P.Q. 769, 779 (Fed. Cir. 1983); M.P.E.P. § 2145. Further, a rejection under 35 U.S.C. § 103 based upon a modification of a reference that destroys the intent, purpose, or function of the invention disclosed in the reference, is improper and the *prima facie* case of obviousness cannot be properly made. There would be no technological motivation for engaging in the modification or change. To the contrary, there would be a disincentive. *In re Gordon*, 221 U.S.P.Q. 1125 (Fed. Cir. 1984).

The Howorth and Valdna et al. references both teach away from using a phosphor that emits in a range of 950nm to 1075nm as recited by claim 1. The Howorth reference explicitly states that the solution to the poor IR detection capabilities of previous photodetectors is incorporation of a phosphor that outputs visible light when illuminated by IR. *See* page 2, lines 21-30. The Valdna et al. reference similarly teaches use of a phosphor that outputs visible light when illuminated by x-rays. *See* col. 1, lines 32-36. The references, when taken as a whole, teach that emitting within the visible portion of the electromagnetic spectrum is a desirable

characteristic for an imaging phosphor, which clearly teaches away from incorporating a phosphor that emits outside of this desired range.

Additionally, modification of the imaging system of Howorth in the manner suggested by the Examiner would absolutely destroy the function of the imaging system. As noted above, the Examiner suggests that it would be obvious to one with ordinary skill in the art to incorporate the phosphor disclosed by the Valdna et al. reference into the camera taught by the Howorth reference. Applicants note that the phosphors of the Valdna et al. reference detect *x-rays* and emit light in response to those *x-rays*. Conversely, the Howorth camera is intended to detect infrared radiation. Modifying the camera in the manner suggested by the Examiner, through substituting an x-ray detecting phosphor for one that responds to infrared light, provides absolutely no benefit to the Howorth camera while preventing the camera from fulfilling its intended purpose of allowing infrared imaging. Accordingly, there would be no technological motivation for engaging in the modification or change.

In view of the remarks set forth above, Applicants respectfully submit that independent claim 1 is patentable over the Howorth and Valdna et al. references. Dependent claims 2, 4, and 7, originally rejected on the basis of the Howorth reference, are similarly believed patentable over the Howorth and Valdna et al. references based on their dependency from an allowable base claim, as well as for the subject matter recited in these claims. Dependent claims 5 and 6 were also rejected by the Examiner on the basis of these two references combined with the Ohwaki et al. reference. However, the Ohwaki et al. reference does nothing to obviate the deficiencies of the two references discussed above. Consequently, these dependent claims are also believed

allowable by virtue of their dependency on their respective allowable base claim, as well as for the subject matter recited in these claims. Accordingly, Applicants respectfully request withdrawal of the Examiner's rejections and allowance of claims 1, 2, and 4-7.

Conclusion

In view of the remarks set forth above, Applicants respectfully request allowance of the pending claims. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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